

$$Q. \frac{\sin^4 x}{2} + \frac{\cos^4 x}{3} = \frac{1}{5}$$

$$\text{then } 1) \tan^2 x = \frac{2}{3} \quad 2) \frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{1}{125}$$

$$3) \tan^2 x = \frac{1}{3} \quad 4) \frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{2}{125}$$

$$\frac{\sin^4 x}{2} + \frac{(1 - \sin^2 x)^2}{3} = \frac{1}{5}$$

$$\frac{\sin^4 x}{2} + \frac{1 + \sin^4 x - 2\sin^2 x}{3} = \frac{1}{5}$$

$$5(3\sin^4 x + 2 + 2\sin^4 x - 4\sin^2 x) = 6$$

$$25\sin^4 x - 20\sin^2 x + 4 = 0$$

$$(5\sin^2 x - 2)^2 = 0$$

$$5\sin^2 x - 2 = 0$$

$$\sin^2 x = \frac{2}{5}$$

$$\cos^2 x = 1 - \sin^2 x = 1 - \frac{2}{5} = \frac{3}{5}$$

$$\tan^2 x = \frac{\frac{2}{5}}{\frac{3}{5}} = \frac{2}{3}$$

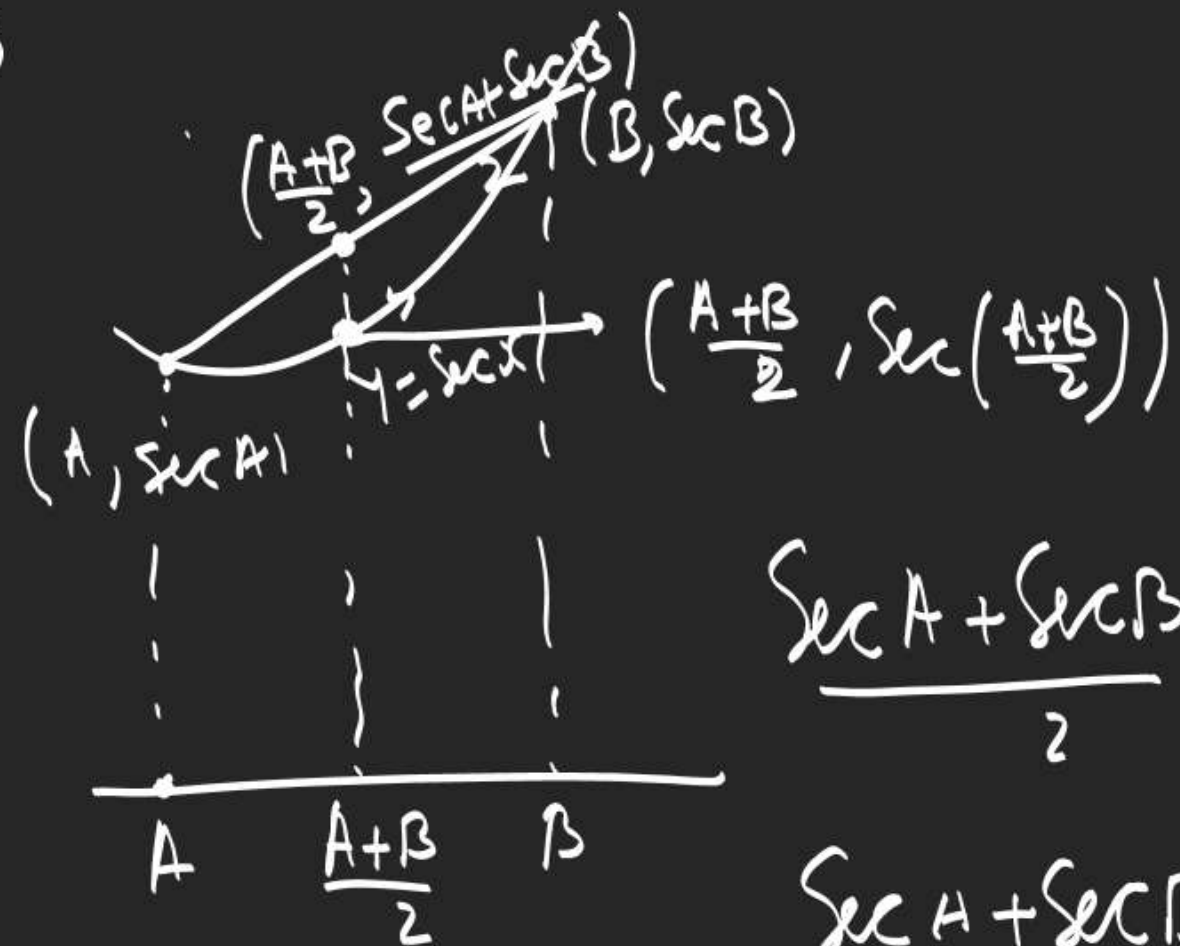
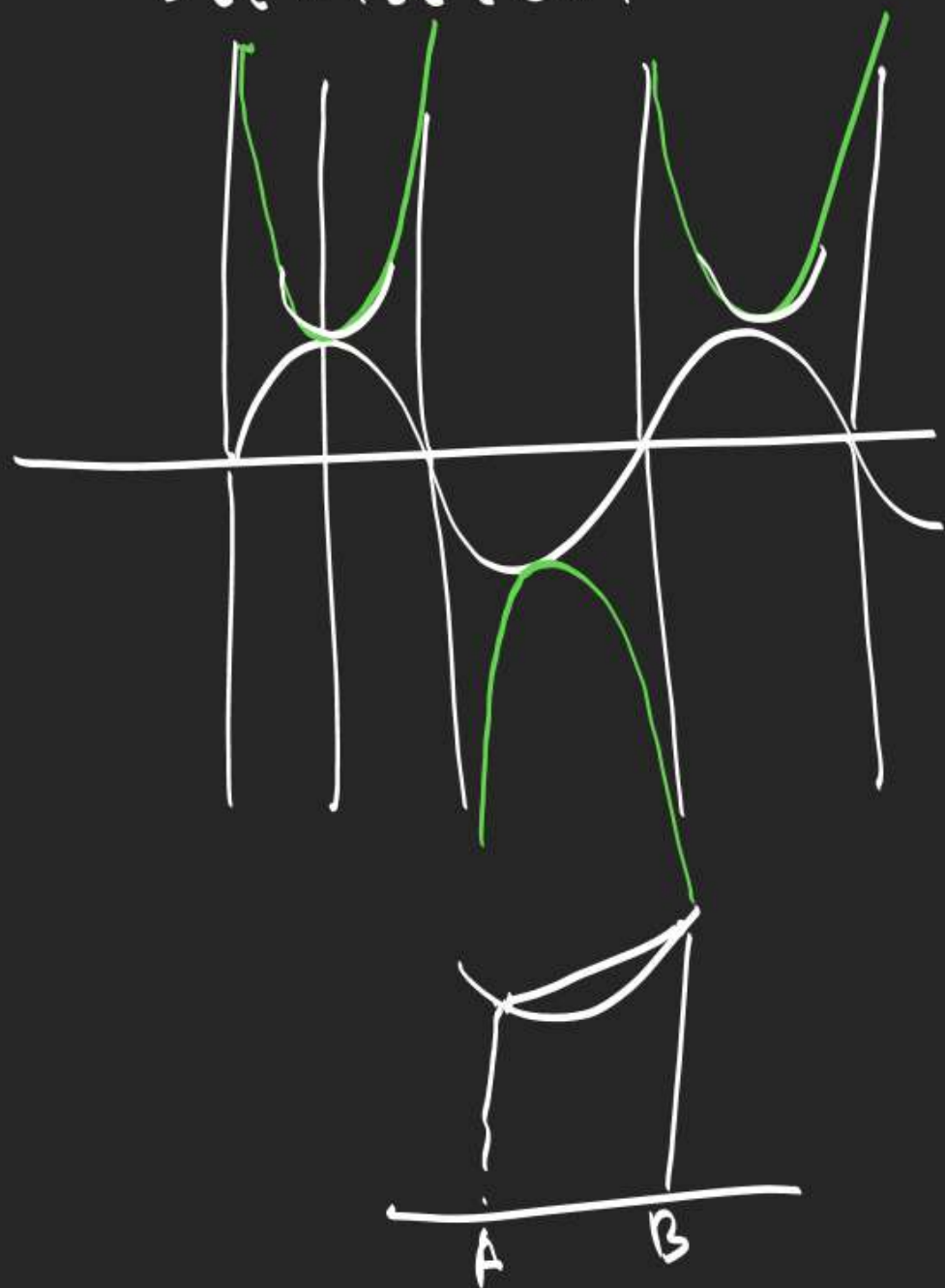
2, 4)

$$\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27}$$

$$\frac{\left(\frac{2}{5}\right)^4}{8} + \frac{\left(\frac{3}{5}\right)^4}{27} = \frac{\cancel{16}^2}{8 \times 625} + \frac{\cancel{81}^3}{625 \times 27}$$

$$= \frac{5}{625} = \frac{1}{125}$$

Q If $A+B = \frac{\pi}{3}$ then Min value of
Ans $\sec A + \sec B = ?$



$$\frac{\sec A + \sec B}{2} \geq \sec\left(\frac{A+B}{2}\right)$$

$$\sec A + \sec B \geq 2 \sec \frac{\pi}{6}$$

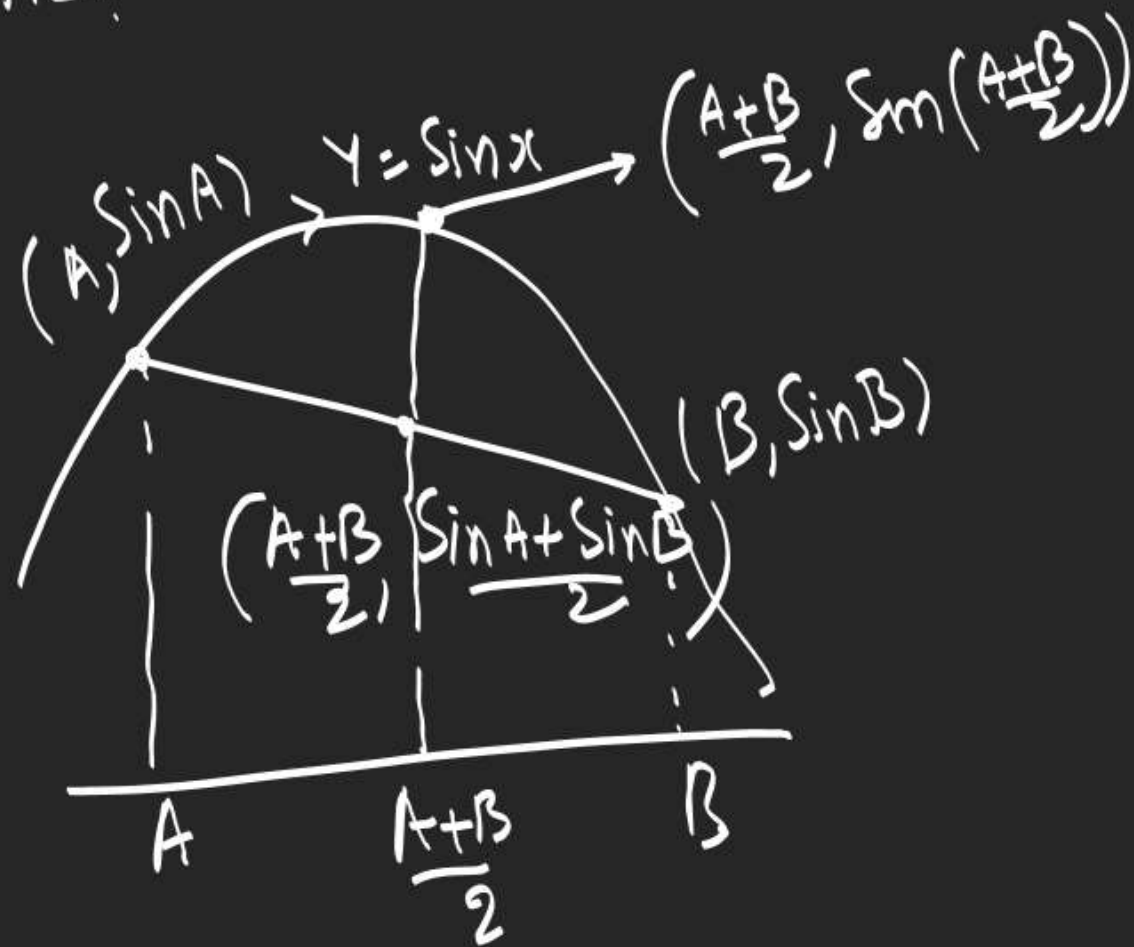
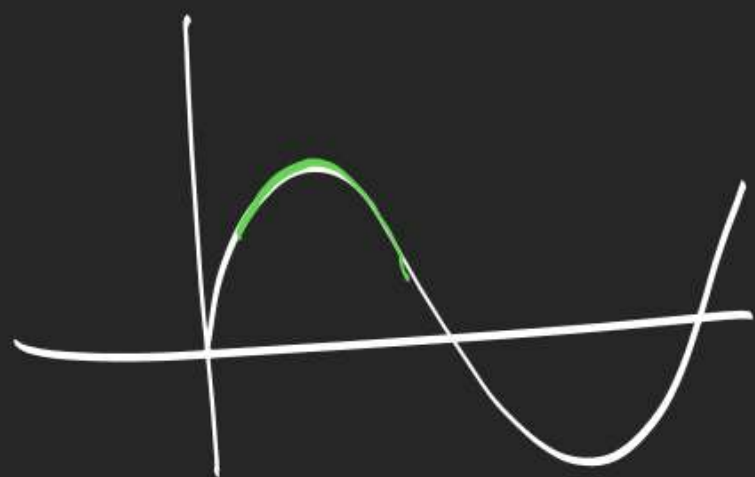
$$\sec A + \sec B \geq 2 \times \frac{2}{\sqrt{3}}$$

$$\sec A + \sec B \geq \frac{4}{\sqrt{3}}$$

$$(\sec A + \sec B)_{\min} = \frac{4}{\sqrt{3}}$$

Q If $A+B=\frac{\pi}{2}$ then Max.

Value of $\sin A + \sin B$?



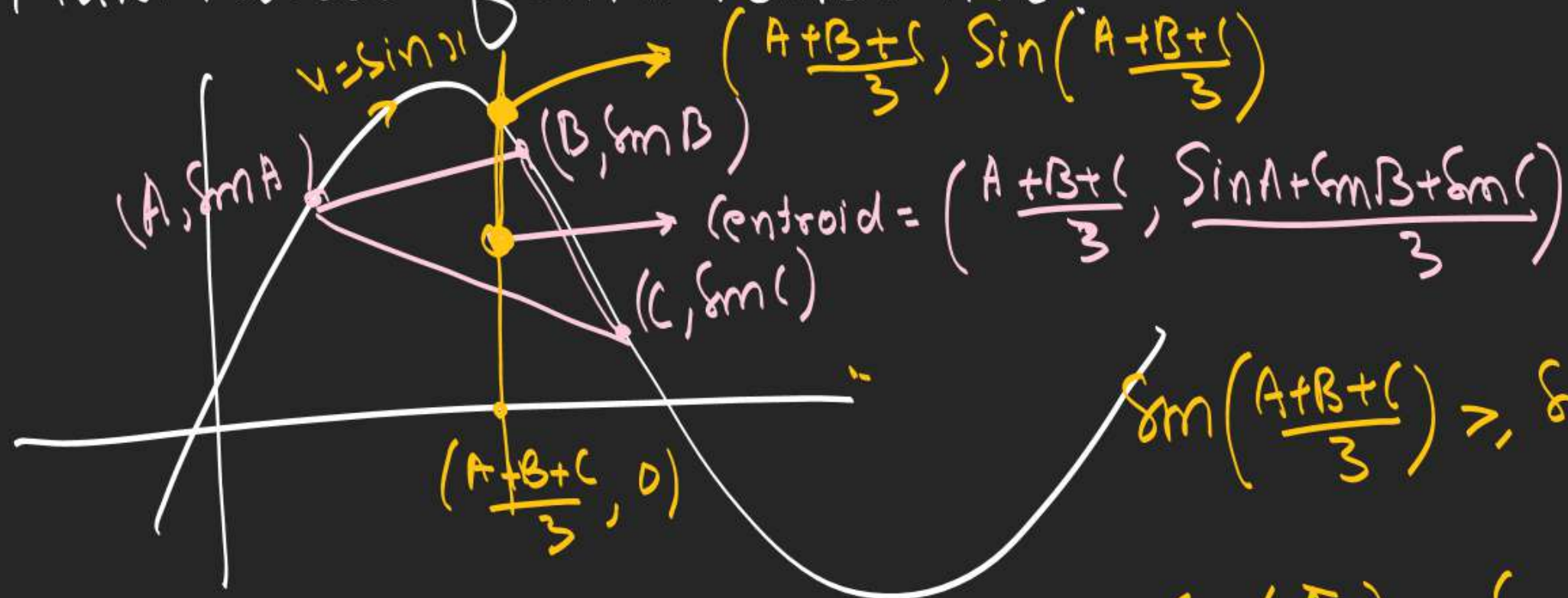
$$\sin\left(\frac{A+B}{2}\right) \geq \frac{\sin A + \sin B}{2}$$

$$\Rightarrow \sin A + \sin B \leq 2 \sin\left(\frac{\pi}{4}\right)$$

$$\sin A + \sin B \leq \sqrt{2}$$

$$(\sin A + \sin B)_{\text{Max}} = \sqrt{2}$$

Q Max. Value of $\sin A + \sin B + \sin C$?



$$\sin\left(\frac{A+B+C}{3}\right) \geq \frac{\sin A + \sin B + \sin C}{3}$$

$$3\sin\left(\frac{\pi}{3}\right) \geq \sin A + \sin B + \sin C$$

$$\sin A + \sin B + \sin C \leq \frac{3\sqrt{3}}{2}$$

P.T.

Q

$$G A \cdot G B \cdot G C \leq \frac{1}{8}$$

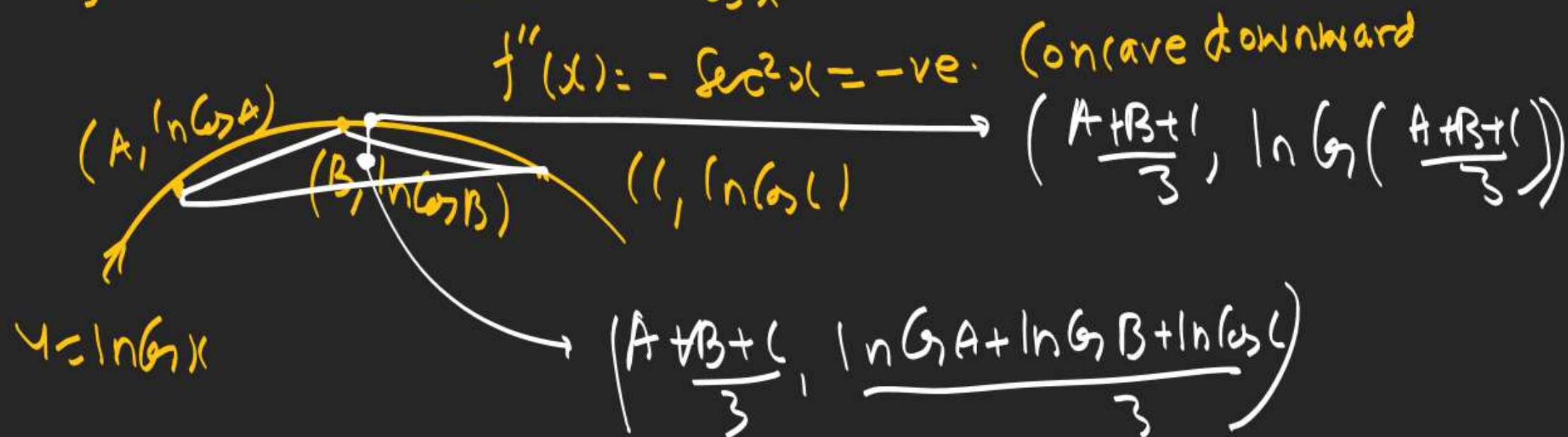
$$x \in (0, \frac{\pi}{2})$$

$$G A \cdot G B \cdot G C \leq \frac{1}{8}$$

Adv

$$f(x) = \ln G x \Rightarrow f'(x) = -\frac{\sin x}{\cos x} = -\tan x = -ve.$$

$$f''(x) = -\sec^2 x = -ve. \text{ (Concave downward)}$$



$$\frac{\ln(GA) + \ln(GB) + \ln(GC)}{3} \leq \ln(G(\frac{A+B+C}{3}))$$

$$\leq \ln(G\frac{\pi}{3})$$

$$\ln(GA \cdot GB \cdot GC) \leq 3 \ln \frac{1}{2}$$

$$\leq \ln \frac{1}{8}$$

Reduction formulae.

$$\left(\frac{\pi}{2} - \theta\right), \left(\frac{\pi}{2} + \theta\right), (n - \theta), (n + \theta)$$

$$\left(\frac{3\pi}{2} - \theta\right) \dots \left(n\frac{\pi}{2} \pm \theta\right) (n\pi \pm \theta) \text{ Study}$$

$$\sin\left(\frac{103\pi}{2} + \theta\right) = -\cos \theta$$

$$\cos(56\pi - \theta) = -\sec \theta$$

$$\tan\left(21\frac{\pi}{2} + \theta\right) = -\cot \theta$$

$$\begin{array}{r} 4 \overline{) 13} \quad 3 \\ \underline{12} \\ 1 \end{array} \quad \begin{array}{r} 4 \overline{) 17} \quad 4 \\ \underline{16} \\ 1 \end{array}$$

$\sin +$

$\pi, 3\pi, 5\pi$
Odd π

$\tan +$

$$\frac{\pi/2, 5\pi/2, 9\pi/2, 13\pi/2, 17\pi/2}{(4n+1)\frac{\pi}{2}}$$

(change) $\begin{cases} \sin \Rightarrow \cos \\ \tan \Rightarrow \cot \\ \sec \Rightarrow \csc \end{cases}$

All +ve

No change.

$2n\pi$
Even π

$0, 2\pi, 4\pi, 6\pi \dots$

$\cos +ve$

① (change π No change) $(4n+3)\frac{\pi}{2}$

② Odd $\rightarrow + \pi -$

$$\frac{3\pi/2, 7\pi/2, 11\pi/2, 15\pi/2, 19\pi/2}{(4n+3)\frac{\pi}{2}}$$



$$1) \sin(-\theta) = -\sin\theta$$

$$2) \cos(-\theta) = \cos\theta$$

$$3) \tan(-\theta) = -\tan\theta$$

$$4) \cot(-\theta) = -\cot\theta$$

$$5) \csc(-\theta) = -\csc\theta$$

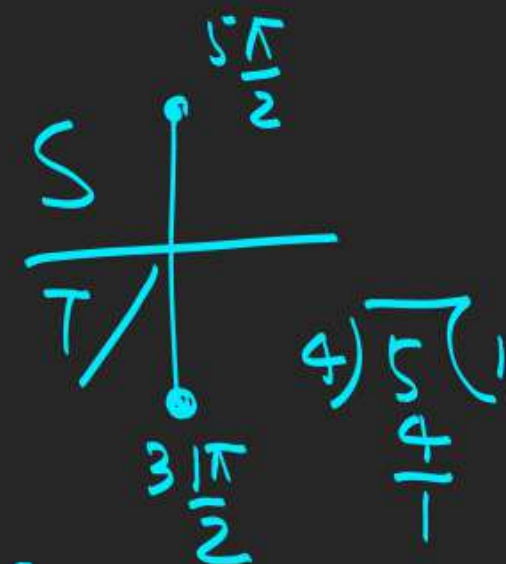
$$6) \sec(-\theta) = \sec\theta$$

Q $\sin^4\left(\frac{3\pi}{2} + \theta\right) \cdot \cos^3\left(\frac{3\pi}{2} - \theta\right)$

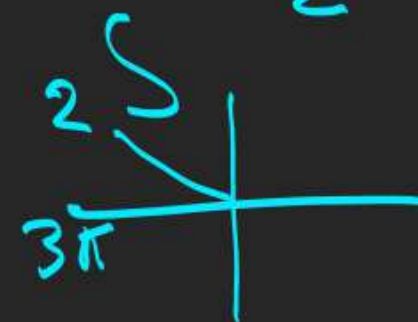
$$(-\sin\theta)(-\sin\theta)^3$$

$$(\sin\theta) \cdot \sin^3\theta$$

$$4) \frac{31}{\frac{28}{3}}$$



Q1) $\sec\left(\frac{3\pi}{2} - \theta\right) = -\sec\theta$



2) $\sin\left(\frac{5\pi}{2} + \theta\right) = +\sin\theta$

3) $\tan(3\pi - \theta) = -\tan\theta$

90°, 180°, 270°, 360°, 450°, 540° —

Q $\tan \boxed{220^\circ} - \cot 230^\circ$

$$\tan(180^\circ + 40^\circ) - \cot(180^\circ + 50^\circ)$$

$$\tan(\boxed{3} \pi + 40^\circ) - \cot(\pi + 50^\circ)$$

$$+ \tan 40^\circ - (+ \cot 50^\circ)$$

$$\tan 40^\circ - \tan 40^\circ$$

$$= 0$$



$$= -\frac{2}{13}$$

$$= -\sec 30^\circ$$

$$\sec(\boxed{2} \pi + 30^\circ)$$

Complementary Angle

If $A + B = 90^\circ \Rightarrow$ then A & B are Complementary Angle.

$$\sin 20^\circ = \cos 70^\circ$$

$$\tan 21^\circ = \cot 69^\circ \quad 21^\circ + 69^\circ = \frac{\pi}{2}$$

$$\sec 150^\circ = \csc(-60^\circ)$$

$$\sec 150^\circ = -\csc 60^\circ = -\frac{2}{\sqrt{3}}$$

Supplementary Angle

Let Given Sum of 2 Angles

is $180^\circ \Rightarrow A+B = \pi$ then.

A & B are Supplementary

$$\sin(\pi - \theta) = + \sin \theta$$

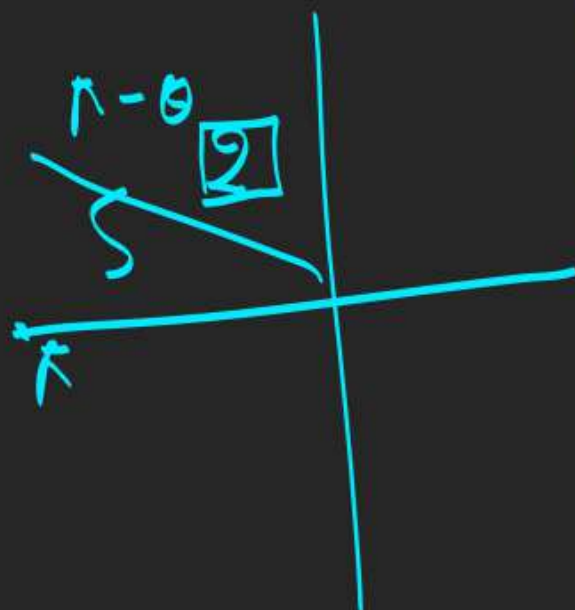
$$\cos(\pi - \theta) = - \cos \theta$$

$$\tan(\pi - \theta) = - \tan \theta$$

$$\cot(\pi - \theta) = - \cot \theta$$

$$\sec(\pi - \theta) = - \sec \theta$$

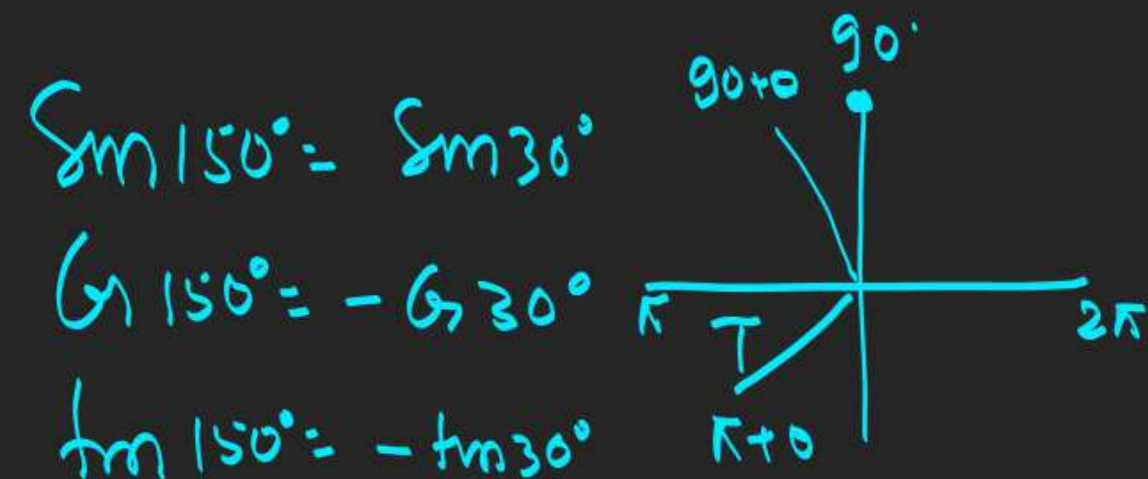
$$\csc(\pi - \theta) = + \csc \theta$$



$$\sin 150^\circ = \sin 30^\circ$$

$$\cos 150^\circ = - \cos 30^\circ$$

$$\tan 150^\circ = - \tan 30^\circ$$



$$Q \frac{\sin(90^\circ + \theta) \cdot \sec(-\theta) + \tan(\frac{180^\circ - \theta}{2})}{\sec(\frac{360^\circ - \theta}{2}) \cdot \sin(\frac{180^\circ + \theta}{3}) \cdot \cot(\frac{90^\circ + \theta}{2})} = ?$$

$$\frac{(-\sin \theta) \sec \theta + (-\tan \theta)}{(+\sec \theta)(+\sin \theta) \cdot (+\tan \theta)}$$

$$= \frac{-\left\{\left(\frac{\sin \theta}{\cos \theta}\right) + \tan \theta\right\}}{\frac{\sin \theta}{\cos \theta} \times \tan \theta} = \frac{-2 \tan \theta}{\tan^2 \theta} = \frac{-2}{\tan \theta}$$

Q If k is Min value of $f(x)$.

$$f(x) = \frac{\sin x}{\sqrt{1-\cos^2 x}} + \frac{\cos x}{\sqrt{1-\sin^2 x}} + \frac{\tan x}{\sqrt{\sec^2 x - 1}} + \frac{\cot x}{\sqrt{1-\tan^2 x}}$$

as x varies overall No. in largest

Possible domain then $|K| = ?$

$$f(x) = \frac{\sin x}{|\sin x|} + \frac{\cos x}{|\cos x|} + \frac{\tan x}{|\tan x|} + \frac{\cot x}{|\cot x|}$$

1st Quad $f(x) = \frac{\sin x}{\sin x} + \frac{\cos x}{\cos x} + \frac{\tan x}{\tan x} + \frac{\cot x}{\cot x} = 1+1+1+1 = 4 \Rightarrow |K| = 4$

2nd Quad $f(x) = \frac{\sin x}{-\sin x} + \frac{\cos x}{-\cos x} + \frac{\tan x}{-\tan x} + \frac{\cot x}{-\cot x} = -1-1-1-1 = -2 \Rightarrow |K| = 2$

3rd $\Rightarrow f(x) = -1-1+1+1 = 0 \Rightarrow |K| = 0$

4th $\Rightarrow f(x) = -1+1-1-1 = -2 \Rightarrow |K| = 2$

Min value of $|K| = 0$

Min value of $K = -2$

then $|K| = 2$ is

2	2
3	4

Q If $\tan \alpha$ is Integral Sol. of $4x^2 - 16x + 15 < 0$.

2 $\cos \beta$ is slope of Bisector of Angles in 1st

Q made betⁿ x & y Axis then. $\tan(\alpha + \beta) : \tan(\alpha - \beta) = ?$



$$1) \tan \beta = 1 \Rightarrow \beta = 0$$

$$2) 4x^2 - 16x + 15 < 0$$

$$4x^2 - 10x - 6x + 15 < 0$$

$$(2x - 3)(2x - 5) < 0$$

$$\frac{3}{2} < x < \frac{5}{2}$$

$$\rightarrow \text{Integer: } 2 \quad \boxed{\tan \alpha = 2}$$

$$\frac{\tan(\alpha + \beta)}{\tan(\alpha - \beta)} = ? \quad \frac{\tan \alpha}{\tan \alpha} = 1$$

$$\rightarrow = \frac{\tan \alpha + \tan \beta}{\tan \alpha - \tan \beta} = \frac{2 + 0}{2 - 0} = 1$$

$$1) \ln(A+B) = \ln A \cos B + G A \sin B.$$

$$\ln(A-B) = \ln A \cos B - G A \sin B.$$

$$G(A+B) = G A \cos B + \ln A \sin B.$$

$$G(A-B) = G A \cos B + \ln A \sin B.$$